

**US OIL RECOVERY SUPERFUND SITE  
WORK PLAN REFINEMENT/MODIFICATION NOTICE**

**REFERENCE DOCUMENTS:** Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Sampling and Analysis Plan Volume I Field Sampling Plan (FSP), Sampling and Analysis Plan Volume II Quality Assurance Project Plan (QAPP) (all dated December 23, 2015)

**WORKPLAN REFINEMENT/MODIFICATION NOTICE NO.: AO1-1-4**

**DATE:** May 19, 2017

**DESCRIPTION OF REFINEMENT/MODIFICATION:**

This Work Plan Refinement Notice (WRN) proposes additional investigation of the potential historic burial pit, of the potential historic vault off the west side of the warehouse, and the northeast slope area.

**Additional Investigation of the Possible Historic Burial Pit**

During the initial on-property soil investigation in the southwest corner of the fenced portion of the site, the presence of the possible historic burial pit was observed in soil boring SB-2. The burial pit is reportedly where contaminated soil removed from the area to the west of the warehouse was placed in 1973 (see Bayer Crop Science 104(e) response). The contaminated soil was reportedly placed in a pit (or pits) located in the southwest corner of the property that was lined with lime and then covered with clean soil. In boring SB-2, what appears to be the lime layer at the bottom of the pit was observed in the soil core at a depth of approximately 8.4 to 9.0 feet below ground surface (ft bgs). A layer of non-native fill, apparently the contaminated soil from the area to the west of the warehouse, was observed above the lime layer in the boring (Attachment 1 – Boring Logs). Soil samples collected from SB-2 within the non-native fill contained elevated concentrations of arsenic and other Constituents of Potential Concern (COPCs) such as other metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides and total petroleum hydrocarbons (TPH) (Attachment 2- Data Tables). Fill material, but no lime layer, was encountered in SB-3, and samples collected from the fill material contained elevated arsenic and other COPC concentrations. No fill material was observed in SB-1 and samples from SB-1 contained much lower concentrations of arsenic and much lower and/or non-detectable concentrations of other COPCs.

In WRN AOI-1-2 dated August 19, 2016, additional work to delineate the possible historic burial pit in the southwest corner of the USOR property using geophysical survey methods was proposed. The geophysical survey was completed on September 22-23, 2016. The data were evaluated, in combination with lithologic and analytical data, to estimate the approximate boundaries of the historic burial pit (Figure 1) and were used to plan additional work to delineate the pit.

The geophysical survey used two methods, the terrain electromagnetic method using a Geonics EM 31 instrument and the resistivity method using a SuperSting R8 resistivity meter. The electromagnetic survey was used to evaluate the horizontal extent of near-surface soil variability, such as the presence of fill material, disturbed soils, or native soil. An area of potentially disturbed soil was indicated by the electromagnetic data and is shown within a pink line on Figure 1. It should be noted that the disturbed soil area may not indicate the presence of the potential pit, i.e., it may indicate soils that have been disturbed as a result of pit construction or other historic activities. The resistivity survey, which was converted to conductivity values, was used to evaluate the vertical and horizontal extent of the potential pit. The transects of the resistivity survey are shown on Figure 1, and show potentially disturbed soil based on the resistivity data. Data from the electromagnetic and resistivity surveys, analytical data, lithologic data and professional judgement were used together to define the approximate extent of the possible historic burial pit, as shown by the black dashed line on Figure 1.

Given the above description of work performed to date, additional investigation of the burial pit area is proposed. The overarching objective of the additional investigation is to fulfill the feasibility study data need of defining the boundaries of this potential historic source area to facilitate development of quantity estimates and evaluation of remedial alternatives. Specific objectives are to: 1) further delineate the extent of the pit, 2) evaluate potential arsenic and other COPC concentrations in soil within and beneath the pit, and 3) evaluate the depth to the uppermost water-bearing unit. The historical documentation related to the 1973 cleanup (Bayer Crop Science 104 (e) response) indicates that arsenic was the contaminant of concern in the soil that was placed in the pit, and this has been confirmed based on data collected to date in this area of the site (Attachment 2). Therefore, the samples collected from borings outside of the pit boundaries under this WRN, including SB-100, SB-101, SB-102, SB-103 and SB-104, will be analyzed for arsenic only since arsenic is the best indicator of the material buried in the pit. Soil samples collected from borings inside the pit, SB-105 and SB-106, will be analyzed for all COPCs defined in the RI/FS Work Plan, including metals, VOCs, SVOCs, pesticides, herbicides and TPH. Additional detail is provided in the following paragraphs.

Borings SB-100 through SB-104 (Figure 1) are proposed to be advanced at the estimated boundary of the pit as indicated by the geophysical data and previous borings. During the drilling of the five pit delineation borings, if indications of the presence of the pit are observed (e.g., observation of the lime layer or a significant layer of fill, as seen in SB-2 and SB-3 in the area), the borehole will be immediately plugged. The rig will then move approximately five feet outward, with the process repeated until a boring is completed without encountering the pit. Based on field observations from the soil borings, the number and location of proposed pit delineation borings may be adjusted. For each delineation boring completed outside the pit area, soil samples will be collected in accordance with the FSP (as "source-area" borings). Sample intervals will include a sample from 0-0.5 feet below ground surface (ft bgs), a sample selected from the 0.5-5.0 ft bgs interval, and a sample selected from 5.0 ft bgs to the top of the uppermost groundwater bearing unit. These samples will be analyzed for arsenic only.

To evaluate arsenic and other COPCs concentrations of the materials inside the pit and potential impacts to soil beneath the pit, borings SB-105 through SB-106 are proposed to be advanced inside the pit once the pit has been delineated as described in the previous paragraph. The two borings will be terminated before the anticipated depth to the uppermost groundwater-bearing unit. Soil samples will be collected from the following intervals:

- One sample will be collected from the fill material within the pit, based on visual indicators of contamination such as odor or staining.
- One sample will be collected from the one-foot interval below the lime layer and one sample will be collected from four to five feet below the lime layer or from a one foot interval at least one foot above the anticipated depth to saturation, whichever comes first. If the lime layer is not present or evident, the samples will be collected from below the fill material within the pit. The samples will be analyzed for the entire suite of COPCs (i.e., metals, pesticides/herbicides, VOCs, SVOCs, and TPH).

Provisions will be made for EPA's oversight contractor to collect split samples from 10% of the samples collected during the field effort.

#### Potential Historic Vault and Culvert

Additional investigation in the area of the potential historic vault and culvert identified to the west of the warehouse. The objective of the proposed activities is to further define underground obstructions that were identified by hand digging, as described below. Furthermore, the work will identify whether there are any additional buried concrete structures in the vicinity and whether the structure that was uncovered was related to the function of the railroad spur.

During the May 2, 2016 mobilization, what appeared to be a continuous obstruction ranging in depth from 0.5 – 4 feet below ground surface was encountered within an area north of the containment pond and west of the warehouse (Figure 2); this obstruction was thought to be the former arsenic vault noted in historical documents.

As approved by WRN dated August 19, 2016, digging and probing of the area was performed on September 23, 2016, to estimate the dimensions of the historical vault. The edges of what is believed to be the vault were encountered during the field effort. Based on data gathered in the field, the vault measures approximately 4.5 by 7 feet (Figure 2). The depth of the vault was not determined due to the difficulty in hand digging the hard clay soils and the amount of overburden soil above the vault (0.5 – 3 feet). It should be noted that the vault is located in the immediate vicinity of a historical railroad spur that runs north-south and adjacent to the warehouse. A potential buried culvert was also discovered during preliminary hand-digging performed in May 2016. Additional digging was performed on September 23, 2016, but due to the depth (3 – 4 feet below ground surface) and the hard clay soils, the full extent of the culvert was not defined.

Due to the hard clay soils and depth of soils above the obstructions in the area, advancing test trenches using a mini-excavator in the former vault area and the potential culvert is proposed. A minimum of two north-south trenches and two east-west trenches will be dug in each area. Preliminary test trench locations are provided on Figure 2. Test trench locations may be adjusted and more test trenches may be added based on field observations. Once the vault boundaries are defined, soil samples from at least one boring adjacent to the vault will be collected to replace SB-23. Soil samples will be collected from the 0-0.5 feet interval, one interval selected from 0.5-5 feet, and one interval selected from 5 feet to the top of the uppermost groundwater bearing unit. Samples will be analyzed for metals, VOCs, SVOCs, pesticides/herbicides, and TPH. Based on the results of the proposed investigation, additional soil boring locations may be recommended to evaluate potential impacts of the historic vault. If there are indications of impacted soil adjacent to the culvert, such as odors or soil staining, additional boring locations may be recommended in that area.

Provisions will be made for EPA's oversight contractor to collect split samples from 10% of the samples collected during the field effort.

#### Additional Borings in On-Property Northeast Slope Area.

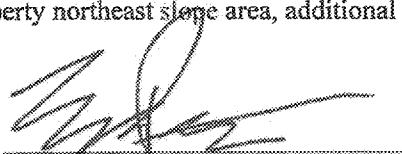
To fill potential data gaps in the area of the on-property northeast slope, additional borings are proposed, as described below. Multiple borings were advanced in the on-property northeast slope area, including SB-34, SB-35, SB-36, SB-37 and SB-39 (Figure 3). Two additional borings are proposed; one boring (SB-107) just off the slope between SB-35 and SB-37, and another at the top of the slope between SB-36 and SB-38 (SB-108). Please note that SB-108 is located in the approximate area of the former sludge bed that is shown on historical site maps and is apparent on historical aerial imagery. The location of the former sludge bed has been adjusted based on review of additional information obtained subsequent to the submittal of the RI/FS Work Plan. Soil samples will be collected from each boring in accordance with the FSP as source-area borings. Sample intervals will include 0-0.5 feet, one sample interval selected from the 0.5-5.0 ft bgs interval, and one sample interval selected from 5.0 ft bgs to the top of the uppermost groundwater bearing unit. All soil samples will be analyzed for the suite of analytes as specified in the FSP, including VOCs, SVOCs, metals, pesticides/herbicides, and TPH.

Provisions will be made for EPA's oversight contractor to collect split samples from 10% of the samples collected during the field effort.

#### RATIONALE FOR REFINEMENT/MODIFICATION:

Additional investigation of the historic burial pit is proposed to further define the boundaries of the pit and the evaluate COPC concentrations within and underneath the pit. Additional investigation of the historical vault and potential buried culvert is needed to further define the extent of these structures. To fill potential data gaps in the on-property northeast slope area, additional borings are proposed in that area.

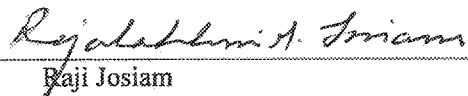
Respondents' Project Coordinator:



Date: 5/26/17

Eric Pastor  
Pastor, Behling & Wheeler, LLC

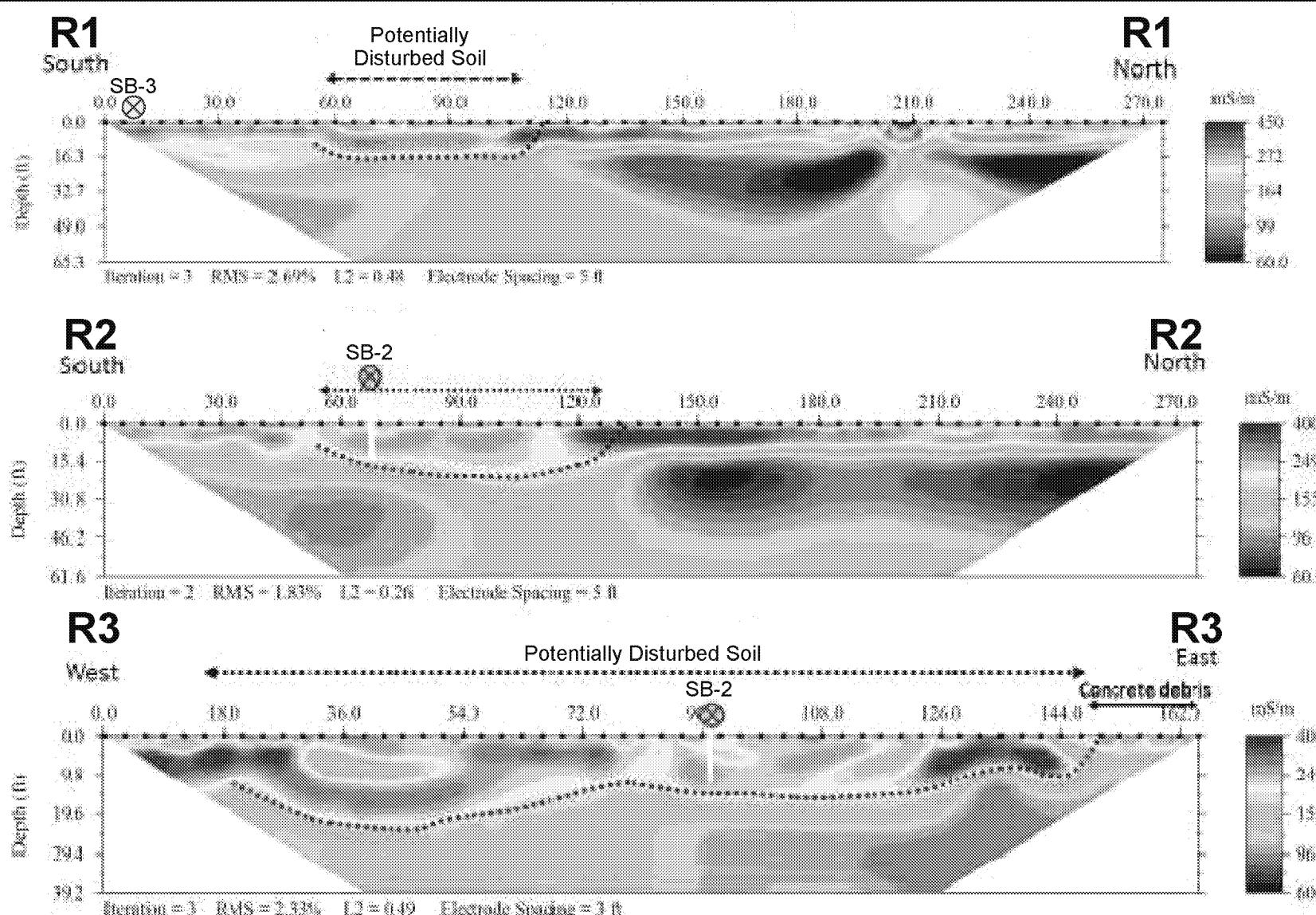
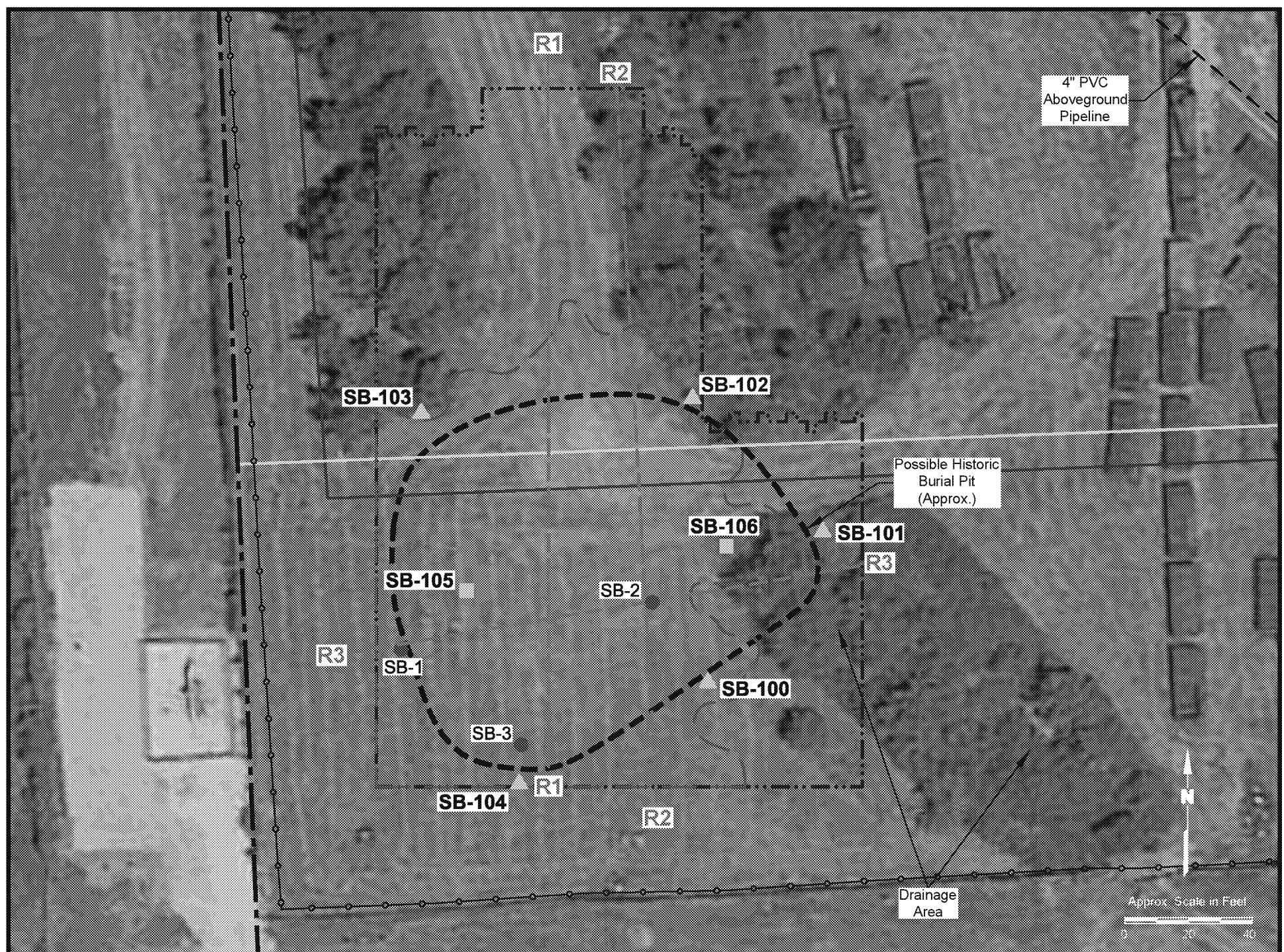
EPA Project Manager:

  
Raji Josiam

Date: 5/26/17

Raji Josiam

## **FIGURES**



#### EXPLANATION

- - - Approx. Property Boundary
- o — Approx. Security Fence
- - - - Shell Pipeline
- - - Air Products Gas Pipeline
- Existing Soil Boring Location
- ▲ Proposed Delineation Boring Location
- Proposed Interior Boring Location
- - - Geophysical Study Area
- - - - Geophysical Conductivity Transect
- - - - Approx. Extent of Potentially Disturbed Soil (Based on Terrain Electromagnetic Survey)
- - - - Possible Historic Burial Pit (Dimensions Estimated as of September 2016)

#### Notes:

1. All locations are approximate, proposed locations are subject to change.
2. The estimated dimensions of the possible historic burial pit are based on a combination of geophysical data, analytical data and lithologic data.

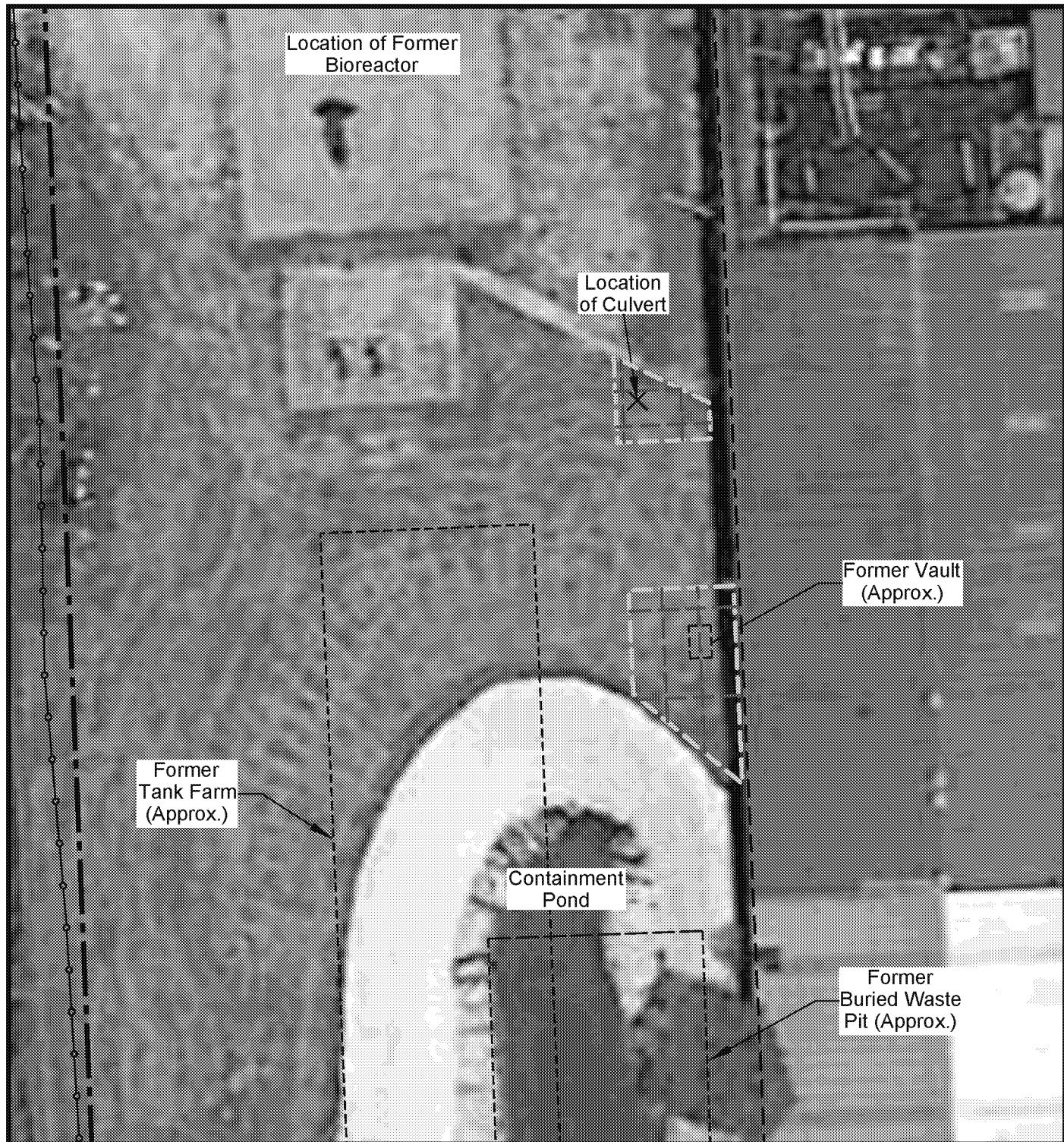
**US OIL RECOVERY SUPERFUND SITE**  
PASADENA, HARRIS COUNTY, TEXAS

Figure 1

#### HISTORIC BURIAL PIT INVESTIGATION FINDINGS AND PROPOSED ADDITIONAL INVESTIGATION

PROJECT: 3333	BY: AJD	REVISIONS
DATE: MAY, 2017	CHECKED: MKW	

**PASTOR, BEHLING & WHEELER, LLC**  
CONSULTING ENGINEERS AND SCIENTISTS



#### EXPLANATION

- - - Approx. Property Boundary
- Approx. Security Fence
- ~~~~~ Proposed Investigation Area
- ~~~~~ Approx. Test Trench Location

N

Approx. Scale in Feet  
0 15 30

US OIL RECOVERY SUPERFUND SITE  
PASADENA, HARRIS COUNTY, TEXAS

Figure 2

#### POTENTIAL HISTORIC VAULT AND CULVERT

PROJECT: 3333	BY: AJD	REVISIONS
DATE: MAY, 2017	CHECKED: MKW	

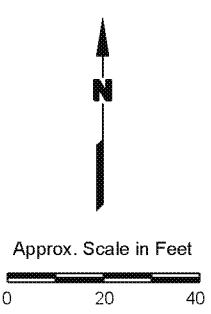
PASTOR, BEHLING & WHEELER, LLC  
CONSULTING ENGINEERS AND SCIENTISTS



#### EXPLANATION

- - - Approx. Property Boundary
- - - Approx. Security Fence
- Proposed Soil Boring Location (Source Areas/Industrial Activities)
- Proposed Soil Boring Location (Drainage Areas)
- Proposed Soil Boring Location (WRN-4)

Notes:  
 1. Proposed locations are approximate and subject to change.  
 2. Highlighted sample locations have been completed.



**US OIL RECOVERY SUPERFUND SITE**  
PASADENA, HARRIS COUNTY, TEXAS

Figure 3

#### **PROPOSED BORINGS IN ON-PROPERTY NORTHEAST SLOPE AREA**

PROJECT: 3333	BY: AJD	REVISIONS
DATE: APR., 2017	CHECKED: MKW	

**PASTOR, BEHLING & WHEELER, LLC**  
CONSULTING ENGINEERS AND SCIENTISTS

**Attachment 1 – Boring Logs  
SB-1, SB-2 and SB-3**

## US Oil Recovery Superfund Site

## Log of Boring: SB-01

US Oil Recovery Superfund Site 400 N. Richey St. Pasadena, TX	Completion Date: 5/4/2016	Drilling Method: Borehole Diameter (in.):	GeoProbe (DPT) 3.0
	Drilling Company: Vortex	Ground Elevation (ft.):	19
	Driller: Heriberto Martinez	Total Depth (ft.):	50
PBW Project No. 3333	Driller's License: 59554	Easting (ft.):	3167546.4
	Field Supervisor: Kevin Dworsky	Northing (ft.):	13827509.1
	Sampling Method: DPT - 2" x 5' Barrel		

Depth (ft)	Recovery (ft/ft)	Sample Intervals for Laboratory Analysis	PID ppm-V	USCS	Lithologic Description
0.0	(0.0-0.5)	17.7			
	5.0/5.0	(3.0-3.5)	10.4	CL	(0 - 4.8) Dark gray sandy clay, moist, firm, gradational contact, medium plasticity, abundance of organic material from 0' to 2', iron nodules, trace caliche, color gradation with depth to light gray.
5.0			10.6		(4.8 - 6.6) Orange/tan silty clay, moist, firm, gradational contact, trace interbeds of fine sand, gray clay nodules, iron staining, black staining.
	5.0/5.0		10.9		
10.0			13.4		
	4.8/5.0		10.6		
15.0			10.1		
	4.8/5.0		7.8		
20.0			7.3		
	4.7/5.0		10.4	CH	
25.0			10.4		
	4.7/5.0		10.5		
30.0			7.9		
	4.8/5.0		9.8		
35.0			8.7		
	4.6/5.0		10.5		
40.0			13.2	CL	(23.0 - 27.7) Orange/tan silty clay, moist, very hard, gradational contact, high plasticity, some mottling of gray clay, trace caliche, trace iron/manganese nodules, staining.
	4.6/5.0		12.7		
45.0			11.2		
	4.6/5.0		8.7		
50.0			13.2	CH	(27.7 - 33.1) Gray silty clay, moist, firm, gradational contact, medium plasticity, iron staining, some fine sand, orange clay lens from 30.5' - 31.6', lens of gray clayey silt with nodules of red sandy clay from 32.4' - 35.0'.
	4.7/5.0	(37.0-39.0)	8.7		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		(33.1 - 36.0) Reddish tan clay, moist, very hard, gradational contact, high plasticity, some gray clay veins, trace caliche nodules, trace black staining, some mottling of orange tan clay.
	3.6/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		(36.0 - 43.6) Gray reddish clay, moist, very hard, sharp contact, high plasticity, mottling of gray and red clay, caliche pebbles, trace black staining.
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		(43.6 - 46.2) Tan sandy silt, wet, soft, gradational contact, no plasticity, fine sand.
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		(46.2 - 49.2) Tan silty clay, moist, firm, abundant silt and some sand interbedded, iron staining, some red clay nodules.
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		(49.2 - 50.0) Reddish tan clay, moist, very hard, high plasticity, some gray clay nodules.
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
	3.6/5.0		7.4		
45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		
	3.8/5.0		13.2		
40.0			7.6		
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45.0			ML		
	3.8/5.0		11.2		
50.0			8.7		

# US Oil Recovery Superfund Site

## **Log of Boring: SB-02**

US Oil Recovery Superfund Site 400 N. Richey St. Pasadena, TX	Completion Date:	5/4/2016	Drilling Method:	GeoProbe (DPT)
	Drilling Company:	Vortex	Borehole Diameter (in.):	3.0
	Driller:	Heriberto Martinez	Ground Elevation (ft.)	17.8
	Driller's License:	59554	Total Depth (ft.):	25
	Field Supervisor:	Kevin Dworsky	Easting (ft.):	3167625.5
PBW Project No. 3333		Sampling Method:	Northing (ft.):	13827523.9

Depth (ft)	Recovery (ft/ft)	Sample Intervals for Laboratory Analysis	PID ppm-V	USCS	Lithologic Description
0.0		(0.0-0.5)	3.8 7.6		
- 4.6/5.0		(3.0-5.0)	12.8		
5.0			22.3	Fill	(0.0 - 8.4) Dark gray to tan sandy/silty clay fill, moist, firm, sharp contact, medium plasticity, mix of dark gray, gray, tan and orangish tan clay, black staining, some gravel (1" - 1.5"), some caliche, fine gravel and sand, trace concrete, iron nodules/staining, oyster shells.
- 4.7/5.0		(7.0-8.4)	25.5 14.8		(8.4 - 9.0) White, moist, sharp contact, chalky, fine grained, lime layer?
10.0			5.7		
- 3.6/5.0			3.9	CH	(9.0 - 16.4) Reddish tan clay, moist, very hard, gradational contact, high plasticity, trace black staining, some thin gray clay veins.
15.0			4.1		
- 2.1/5.0			3.8	CL	(16.4 - 20.5) Orangish tan clay, moist, hard, gradational contact, medium plasticity, some mottling of gray and red clay, trace black staining.
20.0					
- 3.3/5.0				SM	(20.5 - 23.5) Orange tan silty sand, moist, soft, gradational contact, very low plasticity, trace interbedded clay caliche deposits, iron nodules/staining.
25.0				CH	(23.5 - 24.6) Reddish tan clay, moist, very hard, sharp contact, high plasticity, trace gray clay veins, caliche nodules.
				CL	(24.6 - 25) Gray silty clay, moist, firm, low plasticity, some interbedded fine sand, iron staining.

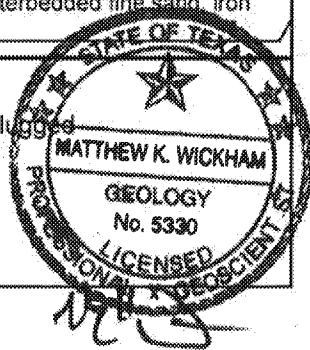


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**Notes:**

After soil boring was completed, boring was plugged with grout from 0.0' - 25.0'

PID - photoionization detector  
USCS - United Soil Classification System



# US Oil Recovery Superfund Site

# Log of Boring: SB-03

US Oil Recovery Superfund Site 400 N. Richey St. Pasadena, TX		Completion Date:	5/3/2016	Drilling Method:	GeoProbe (DPT)
		Drilling Company:	Vortex	Borehole Diameter (in.):	3.0
		Driller:	Heriberto Martinez	Ground Elevation (ft.)	18.7
		Driller's License:	59554	Total Depth (ft.):	25
PBW Project No. 3333		Field Supervisor:	Kevin Dworsky	Easting (ft.):	3167584.2
		Sampling Method:	DPT - 2" x 5' Barrel	Northing (ft.):	13827479.1

Depth (ft)	Recovery (ft/ft)	Sample Intervals for Laboratory Analysis	PID ppm-V	USCS	Lithologic Description
0.0		(0.0-0.5)	7.9 4.1		
	- 4.0/5.0		4.7		
		(3.0-5.0)	9.4	Fill	(0.0 - 6.6) Dark gray sandy clay, moist, hard, gradational contact, mix of dark gray, tan, and red clay, oyster shells, some black staining.
5.0			5.6		
	- 4.1/5.0		10		
		(7.0-9.0)	CL		(6.6 - 11.1) Reddish tan silty clay, moist, very hard, gradational contact, medium plasticity, mottled with gray clay, black staining, trace caliche, some interbedded fine sand.
10.0			9.3		
	- 4.8/5.0		8.4		
			8.8		
15.0			9.7	CH	(11.1 - 20.8) Reddish tan clay, moist, very hard, gradational contact, high plasticity, some gray clay veins and nodules, trace black staining, some caliche deposits.
	- 4.7/5.0		8.2		
20.0			5.7		
	- 4.8/5.0		SM		(20.8 - 23.9) Orange tan silty sand, wet, soft, sharp contact, no plasticity, fine sand, caliche deposits, trace gray clay nodules.
25.0			CH		(23.9 - 25.0) Reddish tan clay, moist, very hard, with caliche pebble nodules, trace gray clay veins.

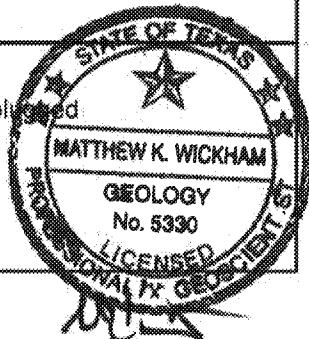


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#### Notes:

After soil boring was completed, boring was plugged with grout from 0.0' - 25.0'.

PID - photoionization detector  
USCS - United Soil Classification System



**Attachment 2 – Data Tables  
SB-1, SB-2 and SB-3**

Table 1  
On-Property Soil Sampling Results: Metals (mg/kg)  
US Oil Recovery Superfund Site, Pasadena, TX

Sample Location	SB-1				SB-2				SB-3			
	Sample Date		5/4/2016		Sample Date		5/4/2016		Sample Date		5/4/2016	
	Soil Horizon	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow
Sample Interval <sup>1</sup>	0.0-0.5	Q <sup>2</sup>	3.0-5.0	Q	37.0-39.0	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-8.4	Q
Aluminum	12,600		11,700		10,900		14,700		15,700		15,600	
Antimony	1.16		<0.251	U	<0.226	U	6.3		4.42		28.1	
Arsenic	40.9		2.63		1.52		444		417		2,030	
Barium	199		158		21.3		187		180		230	
Beryllium	1.16		1.23		0.943		1.47		1.5		1.29	
Boron	5.64		3.22	U	3.17	U	12.9		11		29.3	
Cadmium	0.217	J	<0.0627	U	<0.0564	U	0.746		0.779		2.02	
Chromium	15.5		11.8		10.6		18.5		17.6	JH	19.8	
Cobalt	9.77		6.94		4.92		7.84		14.7		11.1	
Copper	11.7		8.52		5.83		14.1		16.1		20.8	
Lead	26.8		16.7		7.88		43.9		56.8		85.6	
Manganese	519		202		85.6		265		425		562	
Mercury	0.337		0.00119	J	<0.000566	U	10.4		8.92		7.14	
Nickel	15		9.72		17.9		15.3		18.8	JH	16.1	
Selenium	0.797		0.589	J	0.336	U	2.88		2.91		6.44	
Silver	<0.0976	U	<0.100	U	<0.0903	U	<0.0946	U	<0.0979	U	0.14	J
Thallium	0.191	U	0.116	U	0.123	U	0.41	J	0.375	J	2.15	
Vanadium	33.6		25.2		9.87		36.8		34.7	JH	40.4	
Zinc	42.3		18.3		25.1		36.3		36.3	JH	44.3	

NOTES:

1. Sample Interval ranges are recorded as feet below ground surface (ft. bgs)

2. Q = lab qualifiers as follows:

J = Estimated value

U = Analyte not detected at the associated numerical value

R = Rejected

JL = Estimated value, potential low bias

JH = Estimated value, potential high bias

Table 2  
On-Property Soil Sampling Results: Pesticides/Herbicides (mg/kg)  
US Oil Recovery Superfund Site, Pasadena, TX

Sample Location Sample Date Soil Horizon Sample Interval <sup>1</sup>	SB-1 5/4/2016				SB-2 5/4/2016				SB-3 5/4/2016									
	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface	Surface	Shallow	Sub-Surface
	0.0-0.5	Q <sup>2</sup>	3.0-5.0	Q	37.0-39.0	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-8.4	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-9.0	Q
2,4,5-T	<0.0018	U	<0.0019	U	<0.0017	U	<0.0018	U	<0.0019	U	<0.0020	U	<0.0018	U	<0.0019	U	<0.0019	U
2,4,5-TP (Silvex)	<0.0022	U	<0.0023	U	<0.0020	U	<0.0022	U	<0.0023	U	<0.0024	U	<0.0022	U	<0.0023	U	<0.0023	U
2,4-D	<0.00091	U	<0.00093	U	<0.00083	U	<0.00090	U	<0.00094	U	<0.00098	U	<0.00091	U	<0.00095	U	<0.00093	U
2,4-DB	<0.0012	U	<0.0012	U	<0.0011	U	2.7	JH	0.86	JH	0.17	JH	0.061	J	0.36	J	<0.0012	U
4,4'-DDD	0.0066	<0.00066	U	<0.00059	U	0.45	J	0.76		0.26		<0.00065	U	0.16	J	<0.00066	U	
4,4'-DDE	0.013	<0.00066	U	<0.00059	U	1.1		0.35	J	0.25	J	0.004	J	0.34	J	<0.00066	U	
4,4'-DDT	0.0082	JL	<0.00066	JL	<0.00059	JL	2.4	J	0.97	J	<0.00070	U	0.0069	JL	0.46	JL	<0.00066	JL
Aldrin	<0.00039	U	<0.00040	U	<0.00035	U	0.14		0.17		0.032		<0.00039	U	0.029	JH	<0.0004	U
alpha-BHC	0.0023	<0.00040	U	0.0021		0.003		0.13		0.016		<0.00039	U	0.011	J	<0.0004	U	
alpha-Chlordane	<0.00026	U	<0.00026	U	<0.00024	U	0.27	J	0.2	J	0.073	J	<0.00026	U	0.32		<0.00027	U
beta-BHC	0.003	<0.00040	U	<0.00035	U	0.06	J	0.13		0.063		<0.00039	U	0.026	J	<0.0004	U	
Dalapon	<0.0016	U	<0.0016	U	<0.0014	U	<0.0015	U	<0.0016	U	<0.0017	U	<0.0016	U	<0.0016	U	<0.0016	U
delta-BHC	<0.00026	U	<0.00026	U	<0.00024	U	0.0081	J	0.03	J	<0.00028	U	<0.00026	U	0.017	JL	<0.00027	U
Dicamba	<0.0017	U	<0.0017	U	<0.0015	U	<0.0017	U	<0.0017	U	<0.0018	U	<0.0017	U	<0.0018	U	<0.0017	U
Dichlorprop	<0.0021	U	<0.0021	U	<0.0019	U	<0.0021	U	0.011	UJ	<0.0022	U	<0.0021	U	<0.0022	U	<0.0021	U
Dieldrin	0.0054	<0.00066	U	<0.00059	U	1		0.61	J	0.21	J	<0.00065	U	0.16	J	<0.00066	U	
Dinoseb	<0.0018	JL	<0.0019	JL	<0.0017	JL	0.44	JL	0.9	JL	0.22	JL	<0.0018	JL	0.6	JL	<0.0019	JL
Endosulfan I	<0.00039	U	<0.00040	U	<0.00035	U	0.19		0.18	J	0.078	J	<0.00039	U	0.12	J	<0.0004	U
Endosulfan II	0.0041	J	<0.00079	U	<0.00071	U	0.19	J	1.4		0.5		<0.00077	U	0.47		<0.0008	U
Endosulfan sulfate	<0.00077	U	<0.00079	U	<0.00071	U	0.88	J	0.6		0.16		<0.00077	U	0.26	J	<0.0008	U
Endrin	<0.00077	U	<0.00079	U	<0.00071	U	0.69	J	1.2		0.19	J	<0.00077	U	0.29	J	<0.0008	U
Endrin aldehyde	<0.00077	U	<0.00079	U	<0.00071	U	0.63	J	0.52	J	0.21	J	<0.00077	U	0.25		<0.0008	U
Endrin ketone	<0.00077	U	<0.00079	U	<0.00071	U	0.26	J	0.21	J	0.058	J	<0.00077	U	0.04	J	<0.0008	U
gamma-BHC	<0.00026	U	<0.00026	U	<0.00024	U	0.0034	J	0.08		0.0049	J	<0.00026	U	0.0053	J	<0.00027	U
gamma-Chlordane	<0.00026	U	<0.00026	U	<0.00024	U	0.41		0.27		0.054	J	<0.00026	U	0.22	JH	<0.00027	U
Heptachlor	<0.00039	U	<0.00040	U	<0.00035	U	0.034		0.051	J	0.014		<0.00039	U	0.0086	JL	<0.0004	U
Heptachlor epoxide	<0.00039	U	<0.00040	U	<0.00035	U	0.4		0.29	J	0.11		<0.00039	U	0.086	J	<0.0004	U
MCPP	<0.13	U	<0.13	U	<0.12	U	<0.13	U	<0.13	U	<0.14	U	<0.13	U	<0.14	U	<0.13	U
MCPP	<0.21	U	<0.21	U	<0.19	U	<0.21	U	<0.21	U	1.40	J	<0.21	U	<0.22	U	0.70	J
Methoxychlor	<0.0044	U	<0.0045	U	<0.0040	U	2.6	J	0.73	J	0.14	J	<0.0044	U	0.52		<0.0045	U
Toxaphene	<0.0062	U	<0.0064	U	<0.0057	U	<0.0062	U	<0.0064	U	<0.0067	U	<0.0062	U	<0.0065	U	<0.0064	U

NOTES:

1. Sample interval ranges are recorded as feet below ground surface (ft. bgs)

2. Q = lab qualifiers as follows:

J = Estimated value

U = Analyte not detected at the associated numerical value

R = Rejected

JL = Estimated value, potential low bias

JH = Estimated value, potential high bias

**Table 3**  
On-Property Soil Sampling Results: Semi-Volatile Organic Compounds (mg/kg)  
US Oil Recovery Superfund Site, Pasadena, TX

Sample Location Sample Date Soil Horizon Sample Interval <sup>1</sup>	SB-1 5/4/2016						SB-2 5/4/2016						SB-3 5/4/2016					
	Surface		Shallow		Sub Surface		Surface		Shallow		Sub Surface		Surface		Shallow		Sub Surface	
	0.0-0.5	Q <sup>2</sup>	3.0-5.0	Q	37.0-39.0	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-8.4	Q	0.0-0.5	Q	3.0-5.0	Q	5.0-7.0	Q
1,1'-Biphenyl	<0.0022	U	<0.0022	U	<0.0020	U	<0.0022	JL	0.0033	JL	<0.0024	U	<0.0022	U	<0.0023	U	<0.0023	U
1,2,4,5-Tetrachlorobenzene	<0.0013	U	<0.0013	U	<0.0012	U	<0.0013	JL	<0.0013	JL	<0.0014	U	<0.0013	U	<0.0014	U	<0.0013	U
1,4-Dioxane	<0.0028	JL	<0.0029	JL	<0.0026	JL	<0.0028	JL	<0.0029	JL	<0.0031	JL	<0.0029	JL	<0.0030	JL	<0.0029	JL
1-Methylnaphthalene*T <sup>3</sup>	<0.0019	U	<0.0020	U	<0.0018	U	<0.0019	JL	0.013	JL	0.0073		<0.0019	U	<0.0020	U	<0.0020	U
2,3,4,6-Tetrachlorophenol	<0.0037	U	<0.0038	JL	<0.0034	U	<0.0037	JL	<0.0039	JL	<0.0041	U	<0.0038	U	<0.0039	U	<0.0039	U
2,4,5-Trichlorophenol	<0.0032	U	<0.0033	JL	<0.0029	U	<0.0032	JL	<0.0033	JL	<0.0035	U	<0.0032	U	<0.0034	U	<0.0033	U
2,4,6-Trichlorophenol	<0.0022	U	<0.0022	JL	<0.0020	U	<0.0022	JL	<0.0023	JL	<0.0024	JL	<0.0022	U	<0.0023	U	<0.0023	U
2,4-Dichlorophenol	<0.0017	U	<0.0017	JL	<0.0015	U	<0.0017	JL	<0.0017	JL	<0.0018	U	<0.0017	U	<0.0018	U	<0.0017	U
2,4-Dimethylphenol	<0.0043	U	<0.0044	JL	<0.0039	U	<0.0043	JL	<0.0044	JL	<0.0046	U	<0.0043	U	<0.0045	U	<0.0044	U
2,4-Dinitrophenol	<0.0058	U	<0.0060	JL	<0.0053	U	<0.0058	JL	<0.0060	JL	<0.0063	JL	<0.0058	U	<0.0061	U	<0.0060	U
2,4-Dinitrotoluene	<0.0012	U	<0.0012	U	<0.0011	U	<0.0012	JL	<0.0012	JL	<0.0013	U	<0.0012	U	<0.0012	U	<0.0012	U
2,6-Dinitrotoluene	<0.0043	U	<0.0044	U	<0.0039	U	<0.0043	JL	<0.0044	JL	<0.0046	U	<0.0043	U	<0.0045	U	<0.0044	U
2-Chloronaphthalene	<0.0017	JL	<0.0017	JL	<0.0015	JL	<0.0017	JL	<0.0017	JL	<0.0018	U	<0.0017	U	<0.0018	U	<0.0017	U
2-Chlorophenol	<0.0017	U	<0.0017	JL	<0.0015	U	<0.0017	JL	<0.0017	JL	<0.0018	U	<0.0017	U	<0.0018	U	<0.0017	U
2-Methylnaphthalene*L <sup>4</sup> ,T <sup>3</sup>	<0.00064	U	<0.00066	U	<0.00059	U	<0.00065	JL	0.0028	JL	0.012		<0.00065	U	<0.00068	U	<0.00066	U
2-Methylphenol	<0.0014	U	<0.0015	JL	<0.0013	U	<0.0014	JL	<0.0015	JL	<0.0015	U	<0.0014	U	<0.0015	U	<0.0015	U
2-Nitroaniline	<0.0024	U	<0.0025	U	<0.0022	U	<0.0025	JL	<0.0025	JL	<0.0027	U	<0.0025	U	<0.0026	U	<0.0025	U
2-Nitrophenol	<0.0032	U	<0.0033	JL	<0.0029	U	<0.0032	JL	<0.0033	JL	<0.0035	U	<0.0032	U	<0.0034	U	<0.0033	U
3,3'-Dichlorobenzidine	<0.0032	U	<0.0033	U	<0.0029	U	<0.0032	JL	<0.0033	JL	<0.0035	U	<0.0032	U	<0.0034	U	<0.0033	U
3-Methylphenol	<0.0013	U	<0.0013	JL	<0.0012	U	<0.0013	JL	0.016	JL	<0.0014	JL	<0.0013	U	<0.0014	U	<0.0013	U
3-Nitroaniline	<0.0024	U	<0.0025	U	<0.0022	U	<0.0025	JL	<0.0025	JL	<0.0027	JL	<0.0025	U	<0.0026	U	<0.0025	U
4,6-Dinitro-2-methylphenol	<0.0027	U	<0.0028	JL	<0.0025	U	<0.0027	JL	<0.0028	JL	<0.0029	U	<0.0027	U	<0.0028	U	<0.0028	U
4-Bromophenyl phenyl ether	<0.0021	U	<0.0021	U	<0.0019	U	<0.0021	JL	<0.0021	JL	<0.0022	U	<0.0021	U	<0.0022	U	<0.0021	U
4-Chloro-3-methylphenol	<0.00090	U	<0.00093	JL	<0.00082	U	<0.00090	JL	<0.00094	JL	<0.00098	U	<0.00091	U	<0.00095	U	<0.00093	U
4-Chlorophenyl phenyl ether	<0.0019	U	<0.0020	U	<0.0018	U	<0.0019	JL	<0.0020	JL	<0.0021	U	<0.0019	U	<0.0020	U	<0.0020	U
4-Methylphenol	<0.0013	U	<0.0013	JL	<0.0012	U	<0.0013	JL	0.016	JL	<0.0014	JL	<0.0013	U	<0.0014	U	<0.0013	U
4-Nitroaniline	<0.0028	U	<0.0029	U	<0.0026	U	<0.0028	JL	<0.0029	JL	<0.0031	U	<0.0029	U	<0.0030	U	<0.0029	U
4-Nitrophenol	<0.0024	U	<0.0025	JL	<0.0022	U	<0.0025	JL	<0.0025	JL	<0.0027	U	<0.0025	U	<0.0026	U	<0.0025	U
Acenaphthene*L,T <sup>3</sup>	<0.00064	U	<0.00066	U	<0.00059	U	<0.00065	JL	<0.00067	JL	<0.00070	U	<0.00065	U	<0.00068	U	<0.00066	U
Acenaphthylene*L,T <sup>3</sup>	<0.0013	U	<0.0013	U	<0.0012	U	<0.0013	JL	<0.0013	JL	<0.0014	U	<0.0013	U	<0.0014	U	<0.0013	U
Acetophenone	<0.0010	U	<0.0011	U	<0.0009	U	<0.0010	JL	<0.0011	JL	<0.0011	U	<0.0010	U	<0.0011	U	<0.0011	U
Anthracene*L,T <sup>3</sup>	<0.00064	U	<0.00066	U	<0.00059	U	<0.00065	JL	<0.00067	JL	<0.00070	U	0.00087	J	<0.00068	U	<0.00066	U
Atrazine	<0.0026	U	<0.0016	U	<0.0014	U	<0.0026	JL	<0.0016	JL	<0.0017	U	<0.0026	U	<0.0016	U	<0.0016	U
Benz(a)anthracene*H <sup>5</sup> ,T <sup>3</sup>	0.0029	J	<0.0026	U	<0.0024	U	<0.0021	JL	<0.0027	JL	<0.0028	U	0.0068		<0.0027	U	<0.0027	U
Benzaldehyde	<0.0015	JL</																

Table 4  
On-Property Soil Sampling Results: Volatile Organic Compounds (mg/kg)  
US Oil Recovery Superfund Site, Pasadena, TX

Sample Location Sample Date Soil Horizon Sample Interval <sup>1</sup>	SB-1 5/4/2016						SB-2 5/4/2016						SB-3 5/4/2016					
	Surface		Shallow		Sub Surface		Surface		Shallow		Sub Surface		Surface		Shallow		Sub Surface	
	0.0-0.5	Q <sup>2</sup>	3.0-5.0	Q	37.0-39.0	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-8.4	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-9.0	Q
1,1,1,2-Tetrachloroethane	<0.00075	U	<0.00064	U	<0.00055	U	<0.00065	U	<0.00076	U	<0.00072	U	<0.00064	U	<0.0007	U	<0.00067	U
1,1,1-Trichloroethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
1,1,2,2-Tetrachloroethane	<0.0010	U	<0.00085	U	<0.00073	U	<0.00086	U	<0.0010	U	<0.00096	U	<0.00085	U	<0.00094	U	<0.0009	U
1,1,2-Trichlor-1,2,2-trifluoroethane	<0.00088	U	<0.00074	U	<0.00064	U	<0.00075	U	<0.00088	U	<0.00084	U	<0.00075	U	<0.00082	U	<0.00079	U
1,1,2-Trichloroethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
1,1-Dichloroethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
1,1-Dichloroethene	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
1,2,3-Trichlorobenzene	<0.0014	U	<0.0012	U	<0.0010	U	<0.0012	U	<0.0014	U	<0.0013	U	<0.0012	U	<0.0013	JL	<0.0012	U
1,2,4-Trichlorobenzene	<0.0014	U	<0.0012	U	<0.0010	U	0.0037	J	0.057		0.12		<0.0012	U	<0.0013	JL	0.0041	J
1,2,4-Trimethylbenzene	<0.0014	U	<0.0012	U	<0.0010	U	<0.0012	U	0.65		0.4		<0.0012	U	<0.0013	U	<0.0012	U
1,2-Dibromoethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
1,2-Dichlorobenzene	<0.0013	U	<0.0011	U	<0.00091	U	0.0021	J	0.058		0.11		<0.0011	U	<0.0012	U	0.0035	J
1,2-Dichloroethane	<0.00075	U	<0.00064	U	<0.00055	U	<0.00065	U	<0.00076	U	<0.00072	U	<0.00064	U	<0.0007	U	<0.00067	U
1,2-Dichloropropane	<0.0010	U	<0.0009	U	<0.00073	U	<0.00086	U	<0.0010	U	<0.00096	U	<0.00085	U	<0.0009	U	<0.0009	U
1,3,5-Trimethylbenzene	<0.0010	U	<0.00085	U	<0.00073	U	<0.00086	U	0.14		1.4		<0.00085	U	<0.00094	U	<0.0009	U
1,3-Dichlorobenzene	<0.0014	U	<0.0012	U	<0.0010	U	<0.0012	U	<0.0014	U	<0.0013	U	<0.0012	U	<0.0013	U	<0.0012	U
1,4-Dichlorobenzene	<0.0013	U	0.011		<0.00091	U	0.006		0.14		0.57		<0.0011	U	<0.0012	U	0.0095	
2-Butanone	<0.0016	U	<0.0014	U	<0.0012	U	<0.0014	U	<0.0016	U	<0.0016	U	<0.0014	U	<0.0015	U	<0.0015	U
2-Hexanone	<0.0018	U	<0.0015	U	<0.0013	U	<0.0015	U	<0.0018	U	<0.0017	U	<0.0015	U	<0.0016	U	<0.0016	U
4-Methyl-2-pentanone	<0.0025	U	<0.0021	U	<0.0018	U	<0.0022	U	<0.0025	U	<0.0024	U	<0.0021	U	<0.0023	U	<0.0022	U
Acetone	<0.0039	U	<0.0033	U	<0.0028	U	<0.0033	U	<0.0039	U	0.072		<0.0033	U	<0.0036	U	<0.0035	U
Benzene	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	0.019		0.015		<0.00053	U	<0.00059	U	<0.00056	U
Bromodichloromethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
Bromoform	<0.00075	U	<0.00064	U	<0.00055	U	<0.00065	U	<0.00076	U	<0.00072	U	<0.00064	U	<0.0007	U	<0.00067	U
Bromomethane	<0.0013	U	<0.0011	U	<0.00091	U	<0.0011	U	<0.0013	U	<0.0012	U	<0.0011	U	<0.0012	U	<0.0011	U
Carbon disulfide	<0.00075	U	<0.00064	U	<0.00055	U	<0.00065	U	<0.00076	U	<0.00072	U	<0.00064	U	<0.0007	U	<0.00067	U
Carbon tetrachloride	<0.00075	U	<0.00064	U	<0.00055	U	<0.00065	U	<0.00076	U	<0.00072	U	<0.00064	U	<0.0007	U	<0.00067	U
Chlorobenzene	<0.00075	U	0.0078		<0.00055	U	<0.00065	U	0.1		0.11		<0.00064	U	<0.0007	U	0.0025	J
Chloroethane	<0.0010	U	<0.00085	U	<0.00073	U	<0.00086	U	<0.0010	U	<0.00096	U	<0.00085	U	<0.00094	U	<0.0009	U
Chloroform	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
Chloromethane	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
cis-1,2-Dichloroethene	<0.0010	U	<0.00085	U	<0.00073	U	<0.00086	U	<0.0010	U	<0.00096	U	<0.00085	U	<0.00094	U	<0.0009	U
cis-1,3-Dichloropropene	<0.00063	U	<0.00053	U	<0.00046	U	<0.00054	U	<0.00063	U	<0.00060	U	<0.00053	U	<0.00059	U	<0.00056	U
Cyclohexane	<0.0013	U	<0.0011	U	<0.00091	U	<0.0011	U	<0.0013	U	<0.0012	U	&					

Table 5  
On-Property Soil Sampling Results: Total Petroleum Hydrocarbons (mg/kg)  
US Oil Recovery Superfund Site, Pasadena, TX

Sample Location	SB-1				SB-2				SB-3			
	5/4/2016				5/4/2016				5/4/2016			
	Surface	Shallow	Sub Surface	Surface	Shallow	Sub Surface	Surface	Shallow	Sub Surface	Surface	Shallow	Sub Surface
Sample Interval <sup>1</sup>	0.0-0.5	Q <sup>2</sup>	3.0-5.0	Q	37.0-39.0	Q	0.0-0.5	Q	3.0-5.0	Q	7.0-8.4	Q
C6-C12	<12	U	<11	U	<8.9	U	<12	U	<11	U	<13	U
>C12-C28	<12	U	<11	U	<8.9	U	110		99		130	
>C28-C35	<12	U	<11	U	<8.9	U	<12	U	<11	U	<13	U
TPH	<12	U	<11	U	<8.9	U	110		99		130	

NOTES:

1. Sample Interval ranges are recorded as feet below ground surface (ft. bgs)

2. Q = lab qualifiers as follows:

J = Estimated value

U = Analyte not detected at the associated numerical value

R = Rejected

JL = Estimated value, potential low bias

JH = Estimated value, potential high bias